

Interactive comment on “A study of the role of wetlands in defining spatial patterns of near-surface (top 1 m) soil carbon in the Northern Latitudes” by E. M. Blyth et al.

Anonymous Referee #3

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General comments

The authors demonstrate how JULES, with input from a wide range of datasets, can be used to predict soil carbon content across northern latitudes. The result is not very convincing as it fails both in terms of quantity and location (in comparison to other datasets, which themselves are admittedly of limited accuracy). Improvements are made by restricting decomposition under saturated conditions, i.e. in wetlands. This is nothing new – we know pretty well that wetlands accumulate carbon as a result of virtually zero decomposition below the water table. The paper just has a very complicated way of showing this. There is a certain circularity in some of the arguments, e.g. soil carbon mapping is informed by the occurrence of wetlands and then we find that

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soil C correlates with saturated fraction! To be generous, the paper emphasizes the importance of incorporating the role of saturated conditions in limiting decomposition in soil carbon models though this is something that has been known for a long time and there are quite a few models that already do this.

In conclusion, I do not find the paper in its present form up to the standard of Biogeosciences.

Specific comments

P17970 L4 This section tends to be a bit vague on the region considered. The title is for “Northern Latitudes” – described as Arctic + Boreal but here we talk about Arctic only. The NCSCD is permafrost regions only. However a lot of the maps seem to cover everything north of 45°.

P17971 L7 There should be a specific reference to the HWCD (perhaps on P17973 L5), otherwise we do not know where it comes from.

P17973 L12 To me the HWSD looks a bit anemic (Figure 1(a)). I would really expect soil C to 100 cm to go up to at least 50 kg C/m² in peatland areas. I am not clear on its origins, but it seems to underestimate soil C in most regions. The map tells me that most of the northern latitudes have less than 5 kg C/m² (even accounting for the size of the grid squares)!

P17973 L16 The NCSCD specifically covers permafrost areas. This is an important fact that is rather ignored (but explains why Finland and Sweden, and in fact much of northern Europe, apparently has no C!). The presence of permafrost has implications for surface water and such regions are much more likely to be wetlands.

P17974 L1 I presume you mean ‘patterns’, not ‘patters’ (which has another meaning).

P17974 LL20-23 Did you actually test whether soil C could be described by combinations of these drivers?

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P17975 L17 (and Figure 2) I do have an issue with plotting against the temperature values shown. I presume that this is the mean annual temperature. It could be misleading in that zones where winter temperatures plummet to, say, -40°C , will be plotted much lower than zones where it is only, say, -10°C . However, in both cases both production and decomposition will cease. What is more definitive is the length of the growing season, perhaps expressed as degree-days above 0°C , which in the foregoing example may be more equitable.

P17977 L20 You should explain “LSH”.

P17982 LL5-8 These extra areas (hardly trivial) are a bit worrying – how can we rely on the accuracy of the model with such discrepancies?

P17986 L9 What are these models? Any references? Why were they not used in the present paper?

P17986 LL24-28 In contrast, many studies have found increased Q10 values at lower temperatures and in wetland ecosystems (see e.g. Song et al. J. Plant Ecol. 7:419).

P17987 L9 “This study showed. . .” – not really, it was presented from external information. In fact it is previously admitted that the carbon maps may be, in part, dependent upon the presence of wetlands (P17975 L9ff).

P17987 L15ff Not a particularly novel finding.

P17988 L2 “Instead. . .” – the authors should reread this sentence and consider what it means (if anything)!

P17988 L13 But what lesson do we learn from the existence of tropical peatlands?

P17989 L12 How was the normalization done (there are several ways to do this)?

Technical comments

P17973 L12 soil not sol

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P17979 L10 unchanged not un changed

P17982 L3 'model' is used twice in this sentence but it is unclear which model is being referred to; if it is the same model then the argument becomes circular. Needs rephrasing.

P17984 L5 Needs a stop after "Eq (6)".

P17984 L11 This sentence has no verb!

P17985 L16 Omit "In".

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